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SUPPLY ITEMS FOR PRINTERS AND THE LIKE, AND METHOD OF LOADING SUPPLY ITEMS

This application claims the benefit of U.S. Provisional Application 60/400,370 filed July 31, 2002.

Field of the Invention

The invention relates to printers, laminators and other equipment used to produce data bearing identification or financial documents, including plastic cards such as financial (e.g. credit and debit) cards, drivers' licenses, national identification cards, and other similar cards, as well other identification and financial documents, such as passports. In particular, the invention relates to supply items used in such equipment, and to a method of facilitating the loading of the supply items into the equipment.

Background of the Invention

Identification and financial documents, such as financial (e.g. credit and debit) cards, drivers' licenses, national identification cards, and other cards, as well as passports and the like, are well known. These types of documents are often provided with data, graphics or a combination thereof composed of printed characters and/or images printed onto the documents using a printer. An example of a suitable printer for printing a card is disclosed in U.S. Patent 5,762,431.

Many of these types of printers utilize a print ribbon that provides the ink or dye used to produce the data or graphics. These ribbons need to be replaced as they are used up. However, replacement of the ribbon can be difficult, especially for those who are inexperienced or unfamiliar with the printer. It is not unknown for operators of such printers to incorrectly position the take-up cylinder where the supply cylinder is intended to be positioned, and vice-versa, or to try to position the supply and take-up cylinders at incorrect positions within the printer. In addition, the supply and take-up cylinders can be positioned upside down in the printer so that the ribbon is in the wrong

wind direction (e.g. unwound from the supply cylinder and wound onto the take-up cylinder from the bottom of the cylinders rather than from the top).

Similar difficulties exist for other supply items, for example webs that carry laminate patches, cleaning tape or ribbon, holographic overlays, and other exhaustible web materials, used in equipment for producing identification and financial documents.

There is a need for improvements to facilitate loading of supply items into data bearing identification or financial document production equipment.

Summary of the Invention

The invention relates to improvements that facilitate loading of supply items into data bearing identification or financial document production equipment. Supply items include web materials that are used in data bearing identification or financial document production equipment, and which are supplied from a supply cylinder and wound onto a take-up cylinder after use. Examples of supply items include monochromatic and multi-color print ribbons, webs that carry laminate patches, cleaning tape or ribbon, holographic overlays, and other web materials that are used up during use of the equipment. Data bearing identification or financial document production equipment include thermal printers, laminators and combinations thereof, and other equipment that utilize supply items.

In one embodiment, a supply item for data bearing identification or financial document production equipment comprises a supply cylinder, a take-up cylinder, and a web material wound onto the supply cylinder and attachable to the take-up cylinder. The geometry of the take-up cylinder and the supply cylinder are different from each other so that either the take-up cylinder, the supply cylinder, or both, can only be inserted onto the proper spindle. In the preferred embodiment, the geometry of the take-up cylinder is such that it can only be mounted on the take-up spindle.

In another embodiment, a carrier for a supply item used in data bearing identification or financial document production equipment comprises a handle portion having first and second opposite end regions, a supply spindle rotatably mounted to the

handle portion at the first end region, a first pin projecting past the end of the supply spindle, a take-up spindle rotatably mounted to the handle portion at the second end region, and a second pin projecting past the end of the take-up spindle. When viewed in an end plan view, the second pin has a geometry (e.g. a difference in size, shape, or both) that is different than a geometry of the first pin. The difference in geometry of the pins is preferably used in conjunction with features on the supply item so that loading of the supply item onto the carrier is made easier.

A method of facilitating loading of a supply item into data bearing identification or financial document production equipment comprises providing a carrier including a supply spindle assembly and a take-up spindle assembly; providing a supply item including a supply cylinder, a take-up cylinder, and a web material wound onto the supply cylinder and having an end thereof attached to the take-up cylinder. The supply cylinder is intended to be disposed on the supply spindle assembly and the take-up cylinder is intended to be disposed on the take-up spindle assembly. At least one of the supply cylinder and the take-up cylinder, and at least one of the supply spindle assembly and the take-up spindle assembly, are designed so that the supply cylinder or the take-up cylinder can only be disposed on the supply spindle assembly or the take-up spindle assembly respectively.

In another embodiment, data bearing identification or financial document production equipment is provided. The equipment includes a housing, a chassis disposed in the housing having first and second side walls defining a supply item receiving area therebetween that is adapted to at least partially receive a carrier having a supply spindle assembly with a supply cylinder received on the supply spindle assembly and a take-up spindle assembly with a take-up cylinder received on the take-up spindle assembly, with a web material wound onto the supply cylinder and having a take-up end thereof that is attached to the take-up cylinder. The first side wall includes first and second support structures for supporting ends of the supply spindle assembly and the take-up spindle assembly, respectively. In addition, the first support structure and the second support structure have different geometries to match different geometries of the supply spindle assembly and the take-up spindle assembly.

For a better understanding of the invention, its advantages and objects obtained by its use, reference should be made to the drawings which form a further part hereof, and to the accompanying description, in which there is described a preferred embodiment of the invention.

Brief Description of the Drawings

Figure 1 is a perspective view illustrating an unused print ribbon supply item and a carrier for the print ribbon according to the principles of the present invention.

Figure 2A is a perspective view illustrating the print ribbon supply item positioned on the carrier from the spindle side of the carrier.

Figure 2B is an end plan view from the spindle side of the carrier.

Figure 3 is another perspective view of the unused print ribbon supply item and carrier.

Figure 4 illustrates the print ribbon supply item positioned on the carrier from the handle side of the carrier.

Figure 5 is a perspective view of the print ribbon supply item and carrier disposed within a printer.

Figure 6 is an exploded view illustrating how the print ribbon supply item and carrier are positioned in the printer.

Figure 7 is a top view of the print ribbon supply item and carrier disposed in the printer.

Figure 8 illustrates an alternative embodiment of the carrier.

Figure 9 illustrates another alternative embodiment of the carrier.

Detailed Description of the Invention

The invention relates to enhancements that facilitate loading of supply items into data bearing identification or financial document production equipment. The enhancements can be provided on the supply item itself, on a carrier that supports the supply item, on the production equipment, or on a combination thereof. Examples of supply items include monochromatic and multi-color print ribbons, webs that carry

laminate patches, cleaning tape or ribbon, holographic overlays, and other web materials that are used up during use of the equipment. Data bearing identification or financial document production equipment include thermal printers, laminators and combinations thereof, and other equipment that utilize supply items.

The supply item and the carrier are modified to facilitate loading of the supply item onto the carrier in the proper orientation, and the carrier can be more easily loaded into the production equipment in the correct orientation. A variety of modifications can be utilized to achieve these goals. The preferred modification will be discussed in detail below.

For the sake of convenience, the supply item in the preferred embodiment will be described in relation to a multi-color print ribbon, and the production equipment will be described as a thermal printer that utilizes the supply item. However, it is to be realized that the concepts described herein are applicable to other supply items and other production equipment.

A print ribbon supply item 10 according to the invention is best seen in Figures 1-4. The supply item 10 includes a print ribbon 12, preferably a multi-color print ribbon, that supplies the dye or ink used in the printing process. The ribbon 12 is wound onto a supply cylinder 14 that is cylindrical in shape. The ribbon 12 includes a take-up end 16 that is attached to a take-up cylinder 18 that is cylindrical in shape and upon which used ribbon is wound. In Figures 1-4, the ribbon 12 is illustrated as being unused, with substantially the entire extent thereof wound onto the supply cylinder 14, and the end 16 of the ribbon 12 attached to the take-up cylinder 18 ready to take-up used ribbon.

The supply cylinder 14 includes first and second ends 20a, 20b and is generally hollow from the first end to the second end. Likewise, the take-up cylinder 18 includes first and second ends 22a, 22b and is generally hollow from the first end to the second end. Preferably, the ends 20a, 20b, 22a, 22b of the cylinders 14, 18 are designed to facilitate loading of the cylinders 14, 18 onto a carrier 24 (to be later described in detail) in the proper orientation, thereby simplifying ribbon replacement. More

preferably, a difference in the geometry of the ends of the cylinders 14, 18 is used to achieve the simplified replacement.

With reference to Figures 1 and 3, the ends 20a, 20b of the cylinder 14 each define an opening having an area, with the area of the opening at the end 20a being substantially equal to the area of the opening at the end 20b. In addition, the ends 22a, 22b of the cylinder 18 each define an opening having an area. However, the end 22a of the cylinder 18 is closed by a wall 26 that forms part of a cap 28 that is connected to the end 22 of the cylinder 18. An opening 30 is provided in the wall 26. Thus, the area of the opening 30 at the end 22a is different than the area of the opening at the end 22b, and the area of the opening 30 is different than the area of the opening at the end 20a of the cylinder 14.

The difference in the geometry of the openings at the ends 20a, 22a of the cylinders 14, 18 limit how the cylinders 14, 18 can be connected to the carrier 24. While the end of the cylinder 18 is described as having an opening 30 with an area less than the opening at the end of the cylinder 14, it is to be realized that the reduced area opening can be provided on the cylinder 14 rather than on the cylinder 18. In addition, each cylinder could be provided with a reduced area opening, as illustrated in Figure 9, so that the supply and take-up cylinders can only be disposed on the carrier in one orientation.

The carrier 24 forms a structure upon which the cylinders 14, 18 and ribbon 12 can be mounted, and which can then be inserted into the printer. With continued reference to Figures 1-4, the carrier 24 includes a handle portion 32 disposed between opposite end regions 34, 36. The handle portion 32 and end regions 34, 36 are preferably formed of plastic to reduce the weight of the carrier 24. The end regions 34, 36 are generally circular in shape, and have diameters that are greater than the diameters of the cylinders 14, 18.

With reference to Figures 3 and 4, the handle portion 32 comprises a connecting plate 38 that connects the end regions 34, 36. A plate 40 projects substantially perpendicularly from the plate 38 and from the end regions 34, 36. The

plate 40 includes an upper surface that is curved upward, with the plate 40 forming a handle by which the carrier 24 can be carried in a persons hand.

The carrier 24 includes a supply spindle assembly 42 that projects perpendicularly from the end region 34 and a take-up spindle assembly 44 that projects perpendicularly from the end region 36, as best seen in Figures 1 and 3. The spindle assemblies 42 and 44 form means to support the cylinders 14, 18, respectively, and form means to determine which cylinder 14, 18 can be disposed on which spindle assembly.

The spindle assembly 42 comprises a pin 46 and a supply spindle 48 surrounding the pin 46. The length of the spindle 48 and the length of the pin 46 are chosen such that the free end of the pin 46 projects past the end of the spindle 48, as shown in Figures 1 and 3. The spindle 48 is rotatably mounted on the pin 46 so that the spindle 48 can rotate relative to the pin 46. Alternatively, the spindle 48 and pin 46 can be designed to rotate together if desired. Either configuration is possible, as long as the pin 46 projects past the end of the spindle 48.

The spindle 48 is designed to receive the cylinder 14 thereon in such a manner that the cylinder 14 and spindle 48 rotate together with little or no relative rotation therebetween. Rotation between the cylinder 14 and the spindle 48 is prevented by ribs 50 provided on the interior surface of the cylinder and ribs 52 on the outer surface of the spindle 48. Resilient fingers 54 at the end of the spindle 48 snap over the ends of the ribs 50 on the cylinder 14, which are recessed from the end 20a of the cylinder 14, to fasten the cylinder 14 to the spindle 48. This type of connection mechanism between the cylinder 14 and spindle 48 is known in the art.

At the opposite end of the spindle 48, i.e. the end adjacent the handle portion 32, an apertured disk 56 is connected to the spindle for rotation therewith. The disk 50 forms part of a mechanism, well know in the art, to monitor movements of the spindle 48 and thus movements of the supply cylinder 14 to be mounted thereon. The disk 56 is preferably spaced from the end region 34 to provide a space therebetween.

The spindle assembly 44, like the spindle assembly 42, includes a pin 58 and a take-up spindle 60 surrounding the pin 58. The length of the spindle 60 and the length of the pin 58 are chosen such that the free end of the pin 58 projects past the end

of the spindle 60, as shown in Figures 1 and 3. The spindle 60 is rotatably mounted on the pin 58 so that the spindle 60 can rotate relative to the pin 58. Alternatively, the spindle 60 and pin 58 can be designed to rotate together if desired. Either configuration is possible, as long as the pin 58 projects past the end of the spindle 60.

The spindle 60 is designed to receive the take-up cylinder 18 thereon in such a manner that the cylinder 18 and spindle 60 rotate together with little or no relative rotation therebetween. The connection between the cylinder 18 and spindle 60 is similar to the connection between the cylinder 14 and spindle 48. At the opposite end of the spindle 60, i.e. the end adjacent the handle portion 32, a gear 62 is connected to the spindle 60 for rotation therewith. The gear 62 is designed to be driven via a suitable driving mechanism to rotate the spindle 60 and thus the cylinder 18 to take-up used ribbon during use of the printer.

As best seen in Figures 1, 2A and 2B, the end of the pin 46 that projects past the end of the spindle 48 and the end of the pin 58 that projects past the end of the spindle 60 have different geometries from each other. As used herein, different geometries includes differences in sizes, differences in shapes, and combinations of different sizes and shapes.

In the embodiment illustrated in Figure 1, the free end of the pin 46 is generally cylindrical so that, when viewed in an end plan view (Figure 2B), the pin 46 is generally circular. The maximum dimension $\mathbf{D_1}$ (e.g. the diameter for a cylindrical pin or other appropriate effective maximum dimension) of the pin 46 is such that the free end thereof cannot fit through the hole 30 defined in the end 22a of the cylinder 18. In contrast, the free end of the pin 58 is generally fluted so that, when viewed in an end plan view (Figure 2B), the pin 58 is generally in the shape of a plus (+) sign, and the maximum dimension $\mathbf{D_2}$ (i.e. the length of one of the legs defining the plus sign or other effective diameter for other shapes) of the pin 58 is such that the free end thereof is able to fit through the hole 30. The free end of the pin 58 could instead be cylindrical, but of a diameter that is different from the pin 46.

Thus, at least the size of the free ends of the pins 46, 58 are different, and, in the illustrated embodiment, both the size and shape of the free ends are different.

With this construction, if one attempts to insert the take-up cylinder 18 onto the spindle 48 regardless of the orientation of the ends 22a, 22b of the cylinder, interference between the free end of the pin 46 and the hole 30 prevents such insertion. Likewise, if one attempts to reverse the cylinder 18 and slide the end 22a of the cylinder 18 over the spindle 60, interference between the spindle 60 and the hole 30 prevents insertion in this orientation. Therefore, the only way for the cylinder 18 to be inserted onto the spindle 60, while maintaining proper ribbon orientation, is in the orientation illustrated in Figures 1-7 with the end 22b of the cylinder 18 adjacent the end region 36 of the carrier 24.

It is to be realized that the free ends of the pins 46, 58 could have similar shapes but different sizes. For example, as illustrated in Figure 8, each pin 46', 58' is circular in an end plan view, with the pin 58' having a smaller diameter than the pin 46'. In addition, rather than providing the take-up cylinder with the hole 30, the supply cylinder 14 could be provided with the hole so that the cylinder 14 is only insertable onto the spindle 48 in the orientation shown, while preventing insertion of the cylinder 14 onto the spindle 60.

In addition, each cylinder 14, 18 could be provided with features to limit insertion thereof onto the respective appropriate spindle. With reference to Figure 9, the supply cylinder is formed with a rectangular shaped hole 31 in a wall 33 of an end cap 35. The hole 31 is sized to receive a free end of the pin 46" that is rectangular in shape, while the take-up cylinder is formed with the circular shaped hole 30 for interaction with a free end of the pin 58' that is circular. In this embodiment, it is preferred that the pin 46" rotate with the supply spindle and the supply cylinder.

The use of differently shaped pins 46", 58' also alerts a user that there is a difference in the supply and take-up to make the user more wary when loading the supply item. Other shapes for the ends of the pins and the holes could also be used, for example triangular.

The openings at the ends 20b, 22b in Figure 3 are illustrated as being of substantially the same size. However, it is also contemplated that the openings 20b, 22b at the ends could have different sizes. Further, it is contemplated that each end 20a,

20b, 22a, 22b could have different sized openings and/or different geometries to limit how the cylinders 14, 18 can be inserted onto the spindles.

The take-up cylinder 18 could also be provided with memory means to store information pertaining to the supply item as well as other information. The memory means is preferably read/write memory to permit the reading of data from and the writing of data to, the memory means. The memory means can store information pertaining to the remaining amount of ribbon left on the supply cylinder, with the ribbon remaining information being decremented in the memory means based on print jobs using information provided by the printer controller.

The memory means is preferably a radio frequency identification tag 64 mounted on the wall 26 of the cap 28. A suitable RF receiver/transmitter would be positioned in the printer adjacent to the end of the take-up cylinder 18 for reading data and writing data to the tag 64. The use and operation of RF identification tags is known from U.S. Patent 6,099,178.

Figures 5-7 illustrate the print ribbon supply item 10 and carrier 24 in relation to a thermal printer 70. The printer 70 is related to the printer disclosed in U.S. Patent 5,762,431, the entire disclosure of which is incorporated by reference. The printer 70 is used to print data and/or graphics onto plastic cards, for example financial (e.g. credit and debit) cards, drivers' licenses, national identification cards, and other cards. The printer 70 can also be provided with features to perform additional processing operations on the cards, including laminating the cards, printing bar codes, reading from and/or writing to magnetic stripes on the cards, and reading from and/or writing to an integrated circuit chip on the card.

The printer 70 comprises a housing 72 having an input/output end 74 including an input station 76 that holds a plurality of cards and that feeds cards into the printer and an output station 78 for receiving printed cards from the printer. The housing 72 includes a pivotable cover 80 that pivots between an open position, shown in Figure 5, allowing access to the interior of the printer, including a supply item receiving area 82, and a closed position (not shown) during use of the printer 70. A printer chassis 84 is disposed within the interior of the housing 72 for supporting components

of the printer. Further information on this type of printer is disclosed in U.S. Patent 5,762,431.

The print ribbon 12 of the supply item 10 is supported by the carrier 24 within the area 82 of the printer 70. The print ribbon 12 is positioned to be heated by resistive dot elements on a thermal print head (not shown) which transfers thermally reactive dye or ink from the ribbon 12 to a card positioned adjacent the print head. The construction and operation of thermal print heads and print ribbons for use with thermal print heads is well known in the art.

The chassis 84 includes first and second side walls 86, 88 which define the receiving area 82 therebetween. The side wall 86 includes first and second support structures that project inward from the wall 86 for supporting the free ends of the pins 46, 58. Each support structure comprises a base section 90a, 90b that is closed at the bottom thereof to support the ends of the pins, for example pins 46, 58, thereon, and a guide section 92 composed of converging wall portions that converge toward the base section 90a, 90b. The converging construction of the guide sections 92 help to guide the respective free ends of the pins 46, 58 into the respective base sections 90a, 90b, thereby making it easier for an operator of the printer to insert the carrier 24 into the printer 70. As best shown in Figure 7, it is preferred that the base sections 90a, 90b generally match the size of the ends of the pins 46, 58, in which case the size of the base section 90a for the end of the pin 46 is larger than the size of the base section 90b for the end of the pin 58.

As shown in Figure 6, the side wall 88 of the chassis 84 includes cut-outs 94a, 94b that support the spindle assemblies 42, 44 of the carrier 24. In addition, as shown in Figure 7, a gap 96 exists between the outside face of the chassis side wall 88 and the housing 72 structure. When the carrier 24 is properly positioned in the printer 70, the end regions 34, 36 and connecting plate 38 of the carrier 24 are disposed in the gap 96 between the side wall 88 and the housing, while the spindle assemblies 42, 44 and print ribbon supply item 10 are disposed on the opposite side of the side wall 88 within the receiving area 82. Shifting of the carrier 24 toward the opposite side wall 86 is prevented as a result of contact between the end regions 34, 36 and the chassis side

wall 88. Thus, the end regions 34, 36 and the gap 96, along with the ends of the pins 46, 58 hitting the sidewall 88, help a person installing the supply item 10 in knowing that the carrier 24, and thus the supply item 10, are properly positioned.

Turning to Figures 5 and 6, the housing 72 is provided with a cut-out 98. When the carrier 24 is positioned properly, the handle portion 32 is disposed within the cut-out 98, with a gap 100 between the bottom of the handle portion 32 and the cut-out 98. The gap 100 allows room for a persons hand and/or fingers while installing or removing the carrier 24 and supply item 10. Further, the construction of the handle portion 32 is such that it fits into the cut-out 98, thereby providing an indication to the user that the carrier and supply item are properly installed.

The above specification, examples and date provide a complete description of the invention. Many embodiments of the invention, not explicitly described herein, can be made without departing from the spirit and scope of the invention.